REFERENCE SHEET:

Boswellia serrata

Summary

Boswellia serrata is a branching tree and member of the Boswellia genus native to India, Northern Africa, and the Middle East. Its active ingredient, known as boswellic acid (BA), is derived from the gum resin of Boswellia plants and has been traditionally used in Ayurvedic and Unani medicines. BA targets multiple physiological signal transduction cascades providing anti-inflammatory, expectorant, anti-septic, anxiolytic, anti-neurotic, analgesic, tranquilizing, and anti-bacterial properties.

Six major α and β-boswellic acids have been identified, including:

- 3-acetyl-11-keto-β-boswellic acid (AKBA)
- 11-keto-β-boswellic acid (KBA)
- α-boswellic acid (αBA)
- β-boswellic acid (βBA)
- 3-acetyl-α-boswellic acid (AαBA)
- 3-acetyl-β-boswellic acid (AβBA)

Of these BAs, AKBA and KBA possess the most powerful inhibitory effects on pro-inflammatory enzymes and on the production of inflammatory cytokines, which has led to their widespread therapeutic application in chronic inflammatory conditions.

Not be confused with:

- Frankincense (olibanum resin/oil produced by *Boswellia* trees including *Boswellia serrata*, *Boswellia carteri*, *Boswellia frereana*, and *Boswellia sacra*
- Guggul (resin from *Commiphora wightii*, *Commiphora mukul*, *Commiphora gileadensis*, *Boswellia serrata*, *Boswellia carterii*, *Boswellia sacra*, *Boswellia ovalifoliolata*, *Boswellia dalzielii*, *Boswellia frereana*, *and Boswellia thurifera*)

Main Medical Uses

Boswellia serrata is most commonly used in inflammatory disorders, including musculoskeletal, gastrointestinal, respiratory, and dermal inflammatory conditions.

Forms

Form	Standardization
Non-formulated *Boswellia serrata* extracts	Non-formulated extracts used in research have ranged in total BAs >35-80% Contains AKBA: 3.3-4.4%, KBA: 0.45-0.58%, αBA: 0.87-1.6%, βBA: 5.4-25%, AαBA: 3.8-19.3%, and AβBA: 3.8-19.3% Note that extracts may fall outside of this range, and can vary with respect to the proportion of individual BAs.
5-Loxin®, BE-30	Standardized to AKBA: >30%
ApresFLEX®, Aflapin®	Standardized to AKBA: >20% in a non-volatile oil formulation Bioavailability: ~52% more bioavailable than 5-Loxin® in rats
Boswellin®	Standardized to total BAs of >50; AKBA: 30%, KBA: 1.5%, AβBA: 3.5%, and βBA: 7.5%
BSE-18	Standardized to total BAs of >55%; AKBA: 3.7%, KBA: 6.1%, αBA: 13.2%, βBA: 18.2%, AαBA: 3.3%, and AβBA: 10.5%
Cap Wokvel™	Standardized to total BAs of >40%; AKBA: 2%, KBA: 6.44%, αBA: 6.93%, βBA: 18.51%, AαBA 1.853%, and AβBA: 8.58%
H15 Gufic™, Sallaki™	Standardized to total BAs of >30%; AKBA: 1.9-2.8%, KBA: 2.6-3.5%, and AβBA: 8%

Form	Standardization
Phytosome®	Standardized to total BAs of >33% in a 1:1 ratio of soy lecithin formulation (Casperome™) to Boswellia serrata extract Bioavailability: ↑ absorption speed by 1.5-2 hours for all BAs; ↑ plasma Cmax AKBA (4-fold), A β BA, β BA, α BA, and A α BA (2-fold)
S. Compound™	Standardized to contain AKBA: 0.7%, KBA: 0.63%, and 1.5% A β BA/ β BA

Dosing and Administration

Condition	Dosing & administration	Outcome	Class of evidence
Asthma	300 mg (S. Compound™) three times per day to adults for 6 weeks	↓ dyspnea, rhonchi, number of attacks, erythrocyte sedimentation rate, and eosinophils; ↑ FEV1, FVC, and PEFR	C
	500 mg (Casperome®) per day to adults for 4 weeks with ICS and LABAs	↓ the number of concomitant inhalations required per day within 1 week of administration; Effects continue to reduce the frequency of needed concomitant therapy with each week	C
Chronic colitis	350 mg three times per day to adults for 6 weeks	Improved one or more parameters for stool properties, histopathology and scan microscopy, or blood parameters for Hb, Fe, Ca, P, proteins, total leukocytes and eosinophils to a similar extent to sulfasalazine therapy	C
Collagenous colitis (microscopic colitis)	400 mg (80% boswellic acid) three times per day to adults for 6 weeks	↑ chance of clinical remission	C
Crohn's disease	1200 mg (H15 Gufic™) three times per day for 8 weeks	↓ Crohn Disease Activity Index to the same extent as mesalazine	C

Condition	Dosing & administration	Outcome	Class of evidence
Diffuse axonal injury	360 mg (60% *Boswellia serrata* gum resin) three times per day to adolescents or adults for 6 weeks	↑ cognitive ability for self-care score; No effect disability rating scale overall	C
Irritable bowel syndrome	250 mg (Casperome®) per day to adults for 1-6 months	↓ GI pain, cramps, gas, bowel movements, and need for rescue medications or additional medical care to a similar extent to standard therapy within 1 month, but more effectively within 3 months; ↓ oxidative stress by 6 months	C
Joint pain	500 mg (Casperome®) per day for 5 days to athletes with knee pain, then 250 mg per day for 23 days adjunct with acetaminophen or NSAIDs	Compared with standard therapy alone: ↓ VAS-pain score, number of px with pain on effort, joint effusion, structural damage, intramuscular hematomas, biomarkers of cartilage damage and inflammation (COMP and CRP, respectively), and hyperthermic area; ↑ pain-free walking distance	C
	150 mg (FlexiQule®) three times per day to adults with joint pain in the hand for 2 weeks during a standard rehabilitation plan	↓ pain, hyperthermic areas, erythrocyte sedimentation rate and need for NSAIDs or corticosteroids to control pain; ↑ hand function more quickly and effectively than standard rehabilitation alone	C

Condition	Dosing & administration	Outcome	Class of evidence
Knee osteoarthritis (OA) 5-Loxin® and Aflapin® may begin to improve symptoms within 5-7 days, but Aflapin® may be more efficacious than 5-Loxin® in osteoarthritis. Cap Wokvel™ may improve symptoms by 2 months with effects lasting up to 1 month after discontinuation. Onset of effects are slower than COX-2 inhibitors but persist for a greater duration.	50-125 mg (5-Loxin®) twice per day for 3 months to adults with knee OA	↓ pain & stiffness scores, and MMP-3 secretion and TNF α -induced ICAM-1 secretion; ↑ physical function scores	B
	50 mg (Aflapin®) twice per day for 1-3 months to adults with knee OA	↓ pain and stiffness scores; ↑ physical function scores;	B
	333 mg (Cap Wokvel™) three times per day for 2-6 months to adults with knee OA	↓ pain, swelling, and loss of movement scores; ↑ physical function scores	B
	170 mg (Boswellin®) twice per day for 4 months to adults with knee OA	↓ pain & stiffness scores, serum hs-CRP, osteophytes (spur), and reductions in joint space from loss of articular cartilage; ↑ physical function and QoL scores	C
Radiotherapy-induced dermatitis	2% Boswellia topical cream in Phytosome® (Bosexil®) applied to skin twice per day immediately after radiation therapy and before bed to adults with breast cancer	↓ erythema intensity grade and the proportion of patients using topical hydrocortisone therapy	C
Radiotherapy-related edema	1200-1400 mg (H15) three times per day to adults with cerebral tumors during radiotherapy	↓ cerebral edema and may reduce need for steroids during brain irradiation	C
	4500 mg (Monoselect AKBA™) per day to adults with Glioblastoma multiforme during radiochemotherapy with temozolomide for a max of 34 weeks	↑ proportion of reduced or stabilized edema; ↓ use of steroids to treat cerebral edema	C

Condition	Dosing & administration	Outcome	Class of evidence
Rheumatoid arthritis (RA)	400-1200 mg (H15®) two or three times per day to adults for 1-6 months	↓ pain and swelling, erythrocyte sedimentation rate, morning stiffness, and need for NSAIDs; ↑ general health and well-being scores	B
Skin aging	0.5% Boswellia topical cream applied to the face once per day for 30 days	↓ photoaging score, skin roughness, fine lines, sebum excretion; ↑ skin elasticity, thickness, and deposition of collagenous and elastic fibers	C
Type II diabetes	250-400 mg (olibanum gum resin from *Boswellia serrata*) twice per day to adults on metformin for 8-12 weeks	↓ FBG, HBA1C, insulin, total cholesterol, LDL, and TGs	B
	300 mg (gum resin from *Boswellia serrata*) three times per day to adults on oral hypoglycemic therapy for 6 weeks	↓ total cholesterol, LDL-C fructosamine, SGPT and SGOT; ↑ HDL-C	C
Ulcerative colitis	250 mg (Casperome®) per day to adults for 4 weeks	↓ GI pain & cramp intensity and frequency, frequency of diarrhea, feces with blood or mucus, bowel movements, need for medication, and medical attention	C
	300 mg three times per day to adults for 6 weeks	Improves stool properties, histopathology and scan microscopy, and blood parameters for Hb, Fe, Ca, P, proteins, total leukocytes and eosinophils to a similar extent to sulfasalazine therapy	C

For an explanation of the classes of evidence, please see the Rating Scales for Evidence-Based Decision Support.

Adverse Effects

Boswellia serrata is generally considered to be safe. The most commonly reported side effects include gastrointestinal reflux, pain, and/or nausea.

Pharmacokinetics

Absorption

- Stable plasma levels are achieved after 30 hours.
- All six major BAs may be found in the plasma, however the principle acid, AKBA, is not always detectable. All of the acids show high variability.
- BAs have low intestinal absorption due to BAs lipophilic properties. AKBA, A α BA, and A β BA have particularly low absorption as shown in rats.
- Bioavailability can be increased when consumed with fatty food or in soy lecithin formulations. Phosphatidylcholine or phospholipid formulations may also increase bioavailability as shown in rats.

Distribution

- BAs are distributed to the brain, eyes, liver, kidney, and skeletal muscle as shown in rats.

Metabolism

- Phase 1: KBA, α BA, and β BA are metabolised via intestinal and hepatic CYP3A4 mediated oxidation to form hydroxylated metabolites. AKBA, A α BA, and A β BA are not extensively metabolized.
- Phase 2: No major role identified.

Excretion

- BAs have a half-life of approximately six hours.